

Camellia Culture

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A well-filled plant of Debutante, pruned to espalier form to enhance its decorative effect. Given the right kind of attention, camellias will reward the grower with a wealth of exotic, delicate beauty that is matched by very few flowers grown in home gardens.

Camellias

require somewhat more attention than most garden ornamentals, and success in raising them is not always certain. However, the delicacy and beauty of camellia blooms is a delightful reward for the trouble undertaken.

They need:

Soil that is slightly acid.

Shelter from too much sun and wind.

Adequate irrigation.

Fertilizing—but each plant's needs must be judged individually.

Also:

They are reasonably free from attack by pests and diseases. They may be propagated by cuttings, by grafting, or may be raised from seed (if the grower has enough patience).

The blossoms should not be cut, but if the temptation is too great, take as little of the stem as possible.

This circular gives rather complete cultural directions for the successful growing of camellias.

On the back pages are tables of the more popular varieties of camellias, together with comments on their growth and habits.

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Cover photo: A pleasing arrangement of Mrs. Charles Cobb. The blooms are much better than usual for this dark red variety.

Camellia Culture in California

There is a tremendous amount of satisfaction to be had from the production of beautiful camellia blossoms. Perhaps this accounts for the huge growth of popularity in camellia culture both as a hobby and as an industry in California, since the introduction of the plant in the 1850's.

Camellia fanciers have formed a number of organizations which serve the purpose of standardizing varietal names, working out growing problems and making cultural information available to anyone interested, from the professional grower to the newest amateur. Among these are the American Camellia Society (a national organization), and (in Cali-

fornia) the Camellia Society of Kern County, Northern California Camellia Society, Pomona Valley Camellia Society, San Diego Camellia Society, Santa Clara Valley Camellia Society and the Southern California Camellia Society.

Camellia plants are, in many respects, like people. They must be treated as individuals. They are subject to a certain amount of "temperament," so that it is difficult to set up any hard and fast rules that will govern their behavior patterns. This fact should be kept in mind when applying the information contained in this circular to individual, local conditions.

Japanese varieties

are most popular in California

There are 10 or more distinct species of camellias, but of these, only 3 are considered to be of importance at the present time. These 3, *Camellia japonica*, *C. reticulata* and *C. sasanqua*, will be the only ones dealt with at any length in this circular.

The most popular varieties grown in California at present belong to the species *C. japonica*, a native of Japan and China. The flowers may be pink, red, white or variegated in color. The leaves are about 4 inches long, glossy green, ovate or elliptic, with sharp serrations. The photos on pages 6-7 show the latest classification of the varieties of *C. japonica* into 8 classes. These plants will tolerate temperatures down to about 10° F.

C. sasanqua is also a native of China and Japan, but is more straggling in growth and not as hardy as *C. japonica*. It is primarily of interest because it flowers early. It comes in 2 colors, white and pink. Flowers range from single to semidouble and occasionally double. The

branches are pubescent (hairy) when young and the midribs of the leaves are inclined to be hairy also. The leaves are glossy green and about 2 inches long. They are similar in shape to those of *C. japonica*.

C. reticulata is a native of China. Plants are usually sparsely foliated and are not as compact as many Japanese varieties. The plant commonly sold in California as *C. reticulata* is only one of perhaps 20 or more varieties of this species. It has rose pink flowers that average from 5 to 7 inches in diameter. The petals are wavy (see photo, page 5) which adds to the popularity of the flower. The leaves are about 5 inches long and the same shape as those of *C. japonica*.

Other species of camellias may become popular in the future, but at present they are of interest only to collectors and plant breeders.

Classification as to Form of Flower

The botanical characteristics of camel-

lia flowers are used to segregate the many varieties into 8 classes that are widely accepted by growers. This classification is based largely on work done by Dr. H. Harold Hume and Mr. R. J. Wilmot of the University of Florida.

These classifications are given in the chart on pages 6-7.

Naming Varieties

The most commonly accepted names for camellia varieties are those originally given to them, or those made official by the American Camellia Society.

Most people like to start growing camellias by purchasing well-developed plants because the older plants are usually more resistant to unfavorable conditions and will produce more flowers. Cost, however, may be a limiting factor.

If time is of less importance than cost, camellias may be grown from seed, from cuttings, or by grafting. These methods are slow and somewhat hazardous, and are described fully under "Propagation."

Location may be another factor. While camellias may be grown successfully in nearly all parts of California, the best blooms seem to be produced in places where the summers are warm and the winters are chilly. Growers in the interior valleys seem to have the highest percentage of prize blooms, since climatic conditions there are more favorable than they are along the cooler coastal regions.

However, when growing camellias in the valley regions, it is usually necessary to provide some overhead shelter to protect against the extreme summer sunlight.

Selection of Plants

Avoid buying plants which appear to be stunted, or which have roots that are badly matted in the pot or container. Such plants may never be healthy.

Where the original names have been lost, new names have been given, in some cases. In other cases, new names have been substituted for Japanese names that were difficult to remember or to pronounce.

In the tables starting on page 19 a fairly complete list of varieties, with synonyms, is given for the more popular varieties. In all cases, the only names considered valid in this circular are those officially recognized by or adopted through legislation of the American Camellia Society.

Getting started with camellias is expensive

Signs of good health in camellia plants are as follows:

1. Healthy dark green leaves.
2. Good flushes of growth each year.
3. Absence of dead wood.
4. A compact plant for the variety concerned.

If the plant can be tipped out of the container, examine the roots to be sure that they are not badly matted.

The blooms of *Camellia reticulata* are rose pink, with wavy petals, and average from 5 to 7 inches in diameter. Here is a good specimen.



Camellia

1

Name of Class: Single.

Petals: Has 5 to 7 and sometimes 9.

Stamens: All central, united into a cylinder.



2

Name of Class: Semidouble.

Petals: Has more than 9, and usually from 14 to 20.

Stamens: All central, united into a cylinder.



3

Name of Class: Incomplete Double with Large Petals.

Petals: Has numerous large petals.

Stamens: Single stamens, or bunches of stamens or both intermixed.



4

Name of Class: Incomplete Double with Small Inner Petals.

Petals: Numerous small petals within the guard petals.

Stamens: Single stamens or bunches of stamens or both intermixed, forming an irregular mass.



Classification

5

Name of Class: Incomplete Double with Large and Small Inner Petals.

Petals: Numerous large and small petals within the guard petals.

Stamens: Single stamens or bunches of stamens or both, forming an irregular mass.



6

Name of Class: Double Irregular.

Petals: Irregularly arranged in a convex mass, usually small, straplike, and folded, with an outer row of normal petals.

Stamens: If present, are few in number and hidden by petals.



7

Name of Class: Double, Incomplete Imbricated.

Petals: Imbricated except for relatively large, unopened center.

Stamens: None visible.



8

Name of Class: Double, Regular Imbricated or Tiered.

Petals: Regularly imbricated (overlapping like a shingle), or tiered (laid one on top of the other).

Stamens: None.



Camellias won't do well **just anywhere**

The Planting Site

Most camellias need protection from too much hot sunlight, and from drying winds. A north or east exposure will usually provide sufficient shade.

In the central valleys it is sometimes well to provide overhead protection against too much sunlight during the middle of the day, but since camellias need a good amount of heat during the summer season, the overhead protection should not be such that it denies the plants the heat they need. Lattice-work is probably the best method of providing the correct amount of protection.

This is not so important in the cooler coastal regions.

Wind may injure the tender new leaves and cause the blooms to deteriorate rapidly. Any kind of injurious gas or chemical in the air about the plants will have the same effect. Some of the corky cell growth on the underside of the leaves may be due in part to wind damage.

A plant site should be chosen that will provide shelter against the prevailing winds in the region, or some permanent windbreak should be built.

Rain or heavy dew may affect the opened blossoms, but about the only way to protect against wet weather is to provide plants with a temporary roof of some sort. Potted or tubbed plants may be taken to a sheltered porch; a tarpaulin may be put over the lattice-work; specimen blooms may be covered with cellophane. Rain, however, is not a serious problem.

Soil Requirements

Camellias grow well in a variety of soils, but need a slightly acid condition to do their best.

Soil reaction is measured in terms of pH value, which refers to the acid-ion concentration. Neutral soil (neither acid

nor alkaline) tests pH 7. In California some tap water tests pH 8 or higher and soils often test pH 7.5 or higher, meaning that they are decidedly alkaline.

A reaction of pH 5.5 is considered about right for good results with camellias. Since soils vary greatly in pH value, and other growth factors are usually far more important, it is impossible to specify any exact interval between applications of acidifiers. One grower applied aluminum sulfate about once each 4 to 6 weeks but that is more often than is required in most cases. It may not be necessary to use acidifiers if acid fertilizers are used regularly and the soil is about neutral to start with.

Soil testing outfits may be used to determine the acidity of the soil where danger is believed to exist. If the soil is too alkaline and the plants are exposed to hot sun the leaves will begin to show signs of yellowing. In this case a good soil acidifier may be required.

It takes only a small amount of acidifier to change the reaction of any soil. From $\frac{1}{4}$ to $\frac{1}{2}$ pound of aluminum sulfate is sufficient in many cases to acidify one square yard of soil about a plant.

The kind of water used may have some bearing on the soil reaction. A water that is high in lime may need the addition of acid before being applied to camellias. Here again, only a small amount of acidifier is needed. For example, tap water testing pH 9.2 required only one drop of sulfuric acid to 15 gallons of water to bring the reaction down to pH 6.

Copious irrigation at proper intervals will help prevent alkali salts from accumulating near the surface.

The use of acid peat moss or acid leaf mold will usually be adequate to insure proper acidity in soil around camellia plants.

Acid type fertilizer further aids in maintaining soil reaction between pH 5.5 and pH 6.

Planting or Transplanting

Camellias should be transplanted shortly before their new growth pushes out in late winter or early spring. Digging the plants while they are in active growth is not desirable. Transplanting much later than the time that new growth starts may seriously retard the plant.

Plants should not be left in containers longer than one year if this can be avoided. If it becomes necessary to hold larger plants in tubs, they should be re-potted often enough to avoid crowded or matted roots.

The time element mentioned above also

applies to transplanting into the open garden where the plant is to grow permanently. This should be done in late winter or early spring.

Make a hole big enough and deep enough so that the roots can be spread out in their natural position. Several inches of good drainage material, such as gravel, small rocks, sand, or broken pieces of flower pots should be spread at the bottom of the hole so that there will be no danger of water collecting around the roots of the plant. The plant should be set so that after the soil has settled it will stand at about the same depth as it did before transplanting.

Avoid planting too deep—a practice that may aggravate trouble with brachyrhinus grubs (see page 17).

Good cultural practices **will help considerably**

Watering

Camellia plants need watering from the beginning of the dry season in April, up until the start of the rainy season, which may be as late as November. The plants may make 2 or even 3 flushes of growth during this season, and the greater the leaf surface exposed to dry air, the more water the plant will use.

A good rule of thumb in watering is to make sure that the water penetrates down to the full depth of the root system. This requires using judgment, and may be difficult to accomplish because of differences in soil condition and in the size of the plants.

Here is one method of determining how much water is needed:

Set a cup or pan on the ground so that it catches some of the water from a sprinkler. Measure the time it takes to catch one inch of water in the pan. This is the amount of time it takes to deliver one inch of water to the entire soil surface covered by the sprinkler.

An inch of water applied to the surface of sandy soil should wet down to a depth of about 12 inches. The same inch of water will wet an intermediate loam down to a depth of only 6 to 10 inches, and a fine-grained clay soil down to only 4 or 5 inches.

Thus if the camellia plant is in sandy soil, and the roots extend down 24 inches, it would take 2 inches of water delivered to the surface to penetrate down and cover the entire root system. The same plant, in intermediate loam soil, would require about 4 inches of water on the surface; in clay soil, about 5 inches.

Frequency of irrigation is also determined by the soil texture. Heavy clay absorbs more water than sandy soil, and the greater the water-holding capacity of the soil, the less frequently it needs to be irrigated.

Thus a camellia plant in sandy soil, which does not *hold* water, might need irrigating every 4 to 10 days; the same plant in intermediate loam would only

need watering once every 8 to 15 days; in fine-grained clay every 15 to 30 days.

Insufficient watering will usually result in a dull coloring in the leaves, rather than the normal shiny green. The roots can not take up adequate amounts of nourishment unless the soil moisture is above the permanent wilting point.

A surface mulch of well-rotted leaf mold, or of acid peat moss, will hold considerable moisture and have a cooling effect on the surface roots. It may also prove unfavorable to weed growth. The addition of a 2-inch surface mulch once or twice a year is desirable.

Tillage

Tillage is not needed for camellias because they are shallow rooted and heavy tillage will harm the surface roots. Weeds that appear may be hoed out, or pulled out, or killed with a weed spray, if precautions are taken to protect the camellia leaves against spray injury.

Fertilizers

Young camellia plants, with shallow root systems, set out in a fertile soil need little or no fertilizer at the start.

After the plants have become established and have had time to use up most

of the available soil nutrients they will respond to small applications of fertilizer given every 4 to 6 weeks. This practice has been shown to be more effective and probably more economical than large applications made only once or twice during the year.

Applications of fertilizer should be started at the end of the rainy season and at the beginning of new growth for the plant. At that time the plants are in the greatest need of nitrogen. This is usually during March or April.

Organic fertilizers, such as cottonseed meal, fish meal, blood meal, and manufactured sludge can provide adequate amounts of nitrogen for the younger or smaller plants. Older or larger plants may need extra commercial fertilizer during the growing season.

The amount of fertilizer to use on any given plant is best determined by watching the plant itself. In other words, a thriving plant is the one best indication that it is getting sufficient nutrients.

The difficulty in determining any exact amount of fertilizer to apply is due to the differences in the sizes of plants, differences in root systems, and differences in the fertility of soils. The table shown here, however, may be used as a basis for de-

Rate of Applying Some Fertilizers

Fertilizer	No. of ounces* per 100 sq. ft. of soil
Sulfate of ammonia	18
Ammonium nitrate	12
Uramon	9
Treble superphosphate	6
Superphosphate	14
17-7-0	23
16-20 ammonium phosphate-sulfate	24
Complete mixed fertilizers (acid type)	
10 per cent nitrogen	36
8 per cent nitrogen	50
6 per cent nitrogen	64

* Divide by number of applications per year for amount to apply at one time.

ciding how much fertilizer of a given type to *try out*. For very fertile soil or for smaller plants, the amounts shown may be lower; for less fertile soil or larger plants, the amounts may need to be increased.

The above fertilizers may be used separately or in combination to meet the local need.

Woody or shrubby plants such as the camellia should not require much additional phosphate fertilizer, since many California soils already have a good supply. When a phosphate fertilizer is needed, then treblephospate might be included at the rate of about $\frac{1}{4}$ ounce at each of four applications during the year.

One well-known acid-type mixture contains the following:

	pounds
acid phosphate	38
cottonseed meal	28
potassium sulfate	17
ammonium sulfate	10
aluminum sulfate (used as acidifier) . .	10

But in making up any acid-type mixture as the one above, it should be remembered that most California soils are not deficient in potash, and may be only slightly deficient in phosphate, as required by camellias. Therefore the inclusion of potassium sulfate may not give any noticeable benefit. Phosphate may be needed only in small amounts, if at all. It may be that the expense of these ingredients can be saved by leaving them out of the mixture.

Nothing short of actual tests under local conditions will indicate clearly what fertilizing program is needed. Even laboratory tests are of little or no value because other, and more important factors such as water, soil fertility, and temperature are closely related in affecting the plant growth.

Pruning

Camellias require very little pruning. What pruning is done should consist of

removing unwanted branches, shortening in of long branches to give the plant a more desirable shape, and some pinching back of new growth to encourage branching.

Pruning should be done toward the end of the dormant season—about March or April.

All cuts should be made just above a bud or lateral. Never cut back into old wood where no leaves are present. This will greatly retard, or even prevent further growth.

The natural growing habits of the variety should be encouraged. Some varieties are spreading; others are upright; some make very slow growth; some grow rapidly. Some are naturally compact and bushy, but others should be tipped back occasionally to keep them symmetrical.

Chandleri Elegans, for example, is a spreading variety and the main stem should be allowed to continue upright growth until it has reached the desired height. The spreading side branches may be pruned back slightly, if desired.

A vigorous variety, such as Romany (see photo) may make as many as 3 flushes of growth during the season, with each growth from 4 to 8 inches in length. Certain branches may be removed entirely, and others may be shortened in a little. The main upright stem may need support by tying to a stake. Most of the vigorous varieties should have their pruning completed before April 15.

When pinching back, to keep the bush compact, one or more buds of the new growth should be left to continue over-all growth of the plant.

Some varieties will start to form flower buds on the first flush of growth. This new growth should not be pruned away unless necessary for shaping the plant.

Disbudding

Disbudding may be done on some varieties to improve the size of blooms. The practice will not help much, if any, in preventing bud drop where growing con-



This is an example of good pruning—before and after. This vigorous young plant of Romany, or Belgian Red, had made three flushes of growth during the year. Photo at right shows the same plant after pruning and staking. Note much better shape of bush.

ditions are not favorable. (See “Bud Drop,” page 19.)

When camellias form more buds than can be developed properly, the excess should be removed. This should be done as soon as the buds have finally set, and it is possible to determine which are the most promising buds to be left on.

Cutting Flowers

Strictly speaking, camellia blooms should not be cut at all, if the best interests of the plant are to be considered. This is due to the fact that the buds which are to produce new shoots and enhance the value of the plant are just behind the blooms in the axils of the leaves, and it is difficult to remove the flowers without injuring or removing the new growth.

The next best practice, then, is to remove as little stem as possible when cut-

ing flowers. This may be done best by cutting the flower where it joins the stem.

(NEVER BREAK OFF THE FLOWER.)

The blossom can then be floated in a shallow cup or flat bowl, where it will keep fairly well.

If it is felt necessary to have flowers with longer stems, to satisfy a certain arrangement, make cuts just above a leaf bud, or back to a healthy lateral. Remove no more leaves than absolutely necessary.

Occasionally a leaf will be attached so closely to the base of a flower that it has to be removed in cutting. But this type of cutting should, where possible, be confined to those varieties that make long growth during the season, and which have longer stems. Cutting these varieties will present less danger of damaging the following year’s crop of flowers.

Propagation

takes time

Camellias are usually increased by means of rooted cuttings.

A few varieties, however, are difficult to root, even though they are strong growers after they get started.

A very few varieties are extremely difficult to root, or do not grow well on their own roots. For these propagation by grafting is recommended.*

Camellias may also be propagated from seed, but this is usually done to obtain rootstocks for grafting purposes.

The methods employed for these various means of propagation are as follows:

Cuttings

The best cuttings are produced on plants that have grown under lath, or other shelter. Their wood is not too hard.

For best results use the ripened green cuttings of the new growth. The growth that starts to push out in April should be sufficiently matured by late June or early July to make the best cuttings.

It is sometimes possible to root ripened cuttings taken during the dormant period, but these usually take 6 months or more to root, and success is highly doubtful.

Make cutting from 3 to 6 inches long, and include at least 2 or 3 leaf nodes. Leave at least 2 leaves attached near the top. See drawing.

If the cutting has started to make a second flush of growth, the succulent tip may be removed, but the cutting will not root unless it has some leaves near the top.

Leaves on the lower part of the cutting—the part that will be inserted into the rooting medium—should be removed.

If possible, make the cut just below a leaf node.

* These include *Alba Plena*, *Fimbriata* (*Alba Fimbriata*), *Kivo Kanoko*, *Somegawa*, and perhaps some of the weaker *Donckelari* varieties. All of the varieties of *Camellia reticulata* are usually grafted.

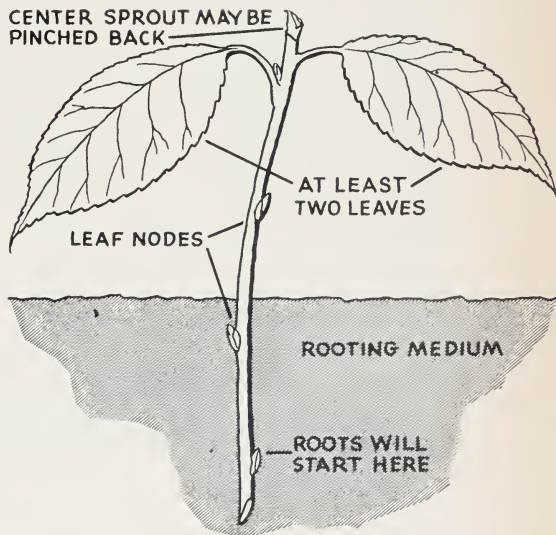
The rooting medium can be any good, coarse, sharp, river sand, which may or may not be mixed with such other material as perlite, pumice, vermiculite or acid peat moss. Very fine results have been obtained with a mixture of 75 per cent coarse sand and 25 per cent acid peat moss.

The use of root hormones as a treatment for cuttings has not been shown to make any appreciable difference in rooting, and it certainly will not take the place of good propagation techniques, such as shading and moisture control. If hormone dusts are used, follow directions on the container.

Insert the cuttings into the rooting medium about half way. If a cutting is very short and in danger of being dislodged when watering, it can be tied to a short stake and held in its proper position.

Water should be applied often enough to keep the rooting medium moist at all times, but not often enough to keep the material saturated.

A very humid atmosphere is needed to protect the cuttings until they are rooted. Some growers use special frames with glassed-in fronts for rooting cuttings, but the usual greenhouse bed or propagating



frame, protected with cheesecloth, should be satisfactory. More than one thickness of cheesecloth will be needed for protection when the summer sun is very hot. An air conditioning system may be necessary in the hot interior areas during July and August.

The regular watering of the cuttings will provide enough air moisture for the desired humidity. Until the cuttings show signs of rooting, the glass covering should be closed. After rooting takes place more air can be given by leaving the glass covering open part way and ultimately the cuttings will not need any covering in the frame, under greenhouse conditions. If the propagating frame is located outside of a greenhouse, then the covering may be partly lifted during the hot part of the day and closed down during mornings and evenings while the cuttings are developing a good root system.

Ripened green cuttings should root in from 6 to 10 weeks. Hardwood cuttings may require 6 months, if they root at all. The two or three leaves left on each cutting should remain intact all through the rooting period. A loss of these leaves will usually mean the loss of the cutting.

To tell when cuttings have formed roots and are getting ready for transplanting it may be necessary to pull a few of them and examine the roots. If they are not yet ready for transplanting, they may be put back in the rooting medium, but they should be put back carefully to avoid injury to what roots there are. Use a dibble or thumb to make a hole in the soil; insert the cutting and pack the soil around it gently.

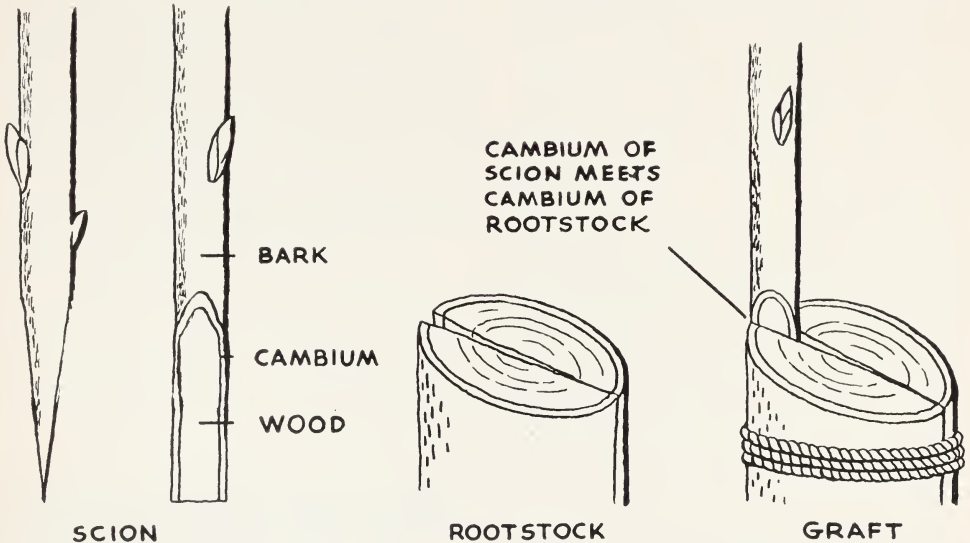
Usually, however, it is possible to tell when cuttings are ready for transplanting by signs of renewed growth and a general healthy condition of the tops.

When cuttings have developed good root systems, they should be transplanted into individual containers and held in a cold frame or shaded greenhouse.

As their root systems increase they should be repotted at least once a year to keep them from becoming root bound. In the second or third year they may be set out in the open garden.

Grafting

Rootstocks for grafting are usually grown from seed because seedlings tend to have the most vigorous root systems.



This shows the three steps in making a cleft graft. The slant of the rootstock should probably be greater than that shown in the drawing, for best results. Great care should be taken to insure that the cambium of the scion meets the cambium of the rootstock, or union may not take place.

There is no reason, however, why rooted cuttings that show considerable vigor and evidence of having good root systems can not be used for grafting.

Grafting may be done in a number of ways. The cleft graft (most common) and the bark graft (next most common) are the only ones recommended and described here.

The *cleft graft* is used mostly from December through January and February. Choose a healthy, vigorous rootstock, cut off the top 3 to 5 inches above the ground. Use a slanting cut (see drawing, page 14). Split the top of the bevel for a distance of about 1 or 2 inches.

Choose as a scion (the part that will be grown on the rootstock) a healthy mature cutting from the past season's growth. Cut scion from 4 to 6 inches long and cut lower end to a wedge.

Insert the scion into the high side of the split in the rootstock so that the cambium (inner layer of bark and outer layer of wood) of the two meet exactly.

Tie the junction securely by wrapping a cord around the rootstock. Cover the

top of the entire plant with a bell jar, or other covering adequate to maintain considerable humidity while the graft is uniting.

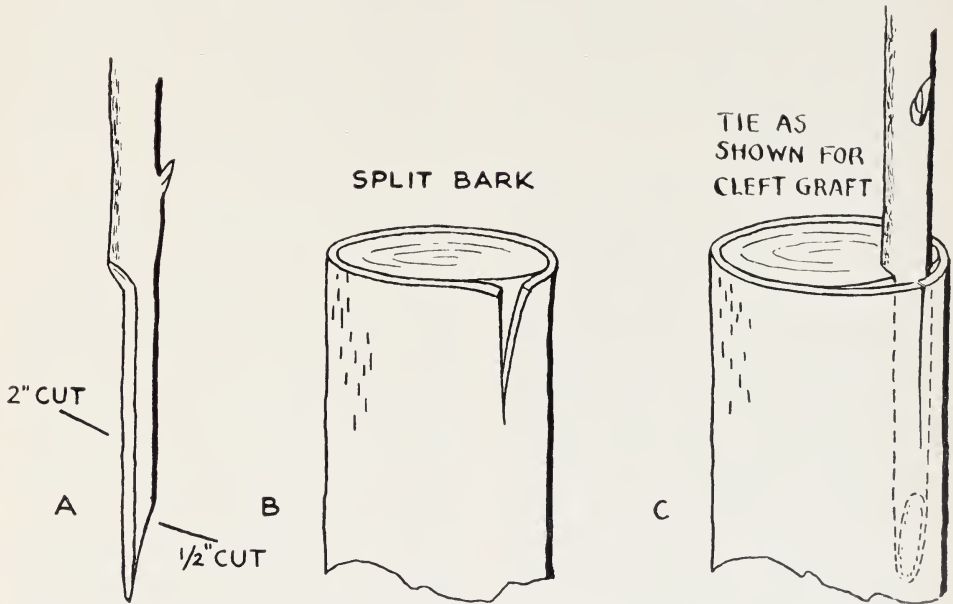
In place of a bell jar, it is possible to use a large tin can with both ends cut out. The lower end is placed on the soil and the upper end is covered with a piece of flat glass. Ventilation may be controlled by moving the glass on the top rim of the can.

The graft should be watched to see that the surface remains healthy.

If fungi appear on the surface near the cut it usually indicates that the graft needs more air. Lift the cover during the cool part of the day and this trouble will usually disappear. If not, the graft should be treated with a safe disinfectant such as Cuprocide or similar copper fungicidal dust.

Bark grafts should be made during the early summer, when the bark of the rootstock is more pliable.

For a scion take wood from the current season's growth that has hardened sufficiently to be able to withstand severe wilt-



Here are the three steps used in making a bark graft. If cuts in scion are made properly, there is less chance of the cambium layers failing to unite. Splitting the bark, however, is a delicate job and must be done carefully. This type of graft must be tied with cord too.

ing. Make a cutting about 4 to 6 inches long, with at least 3 leaf buds. The leaves may be cut in half to reduce evaporation while the scion is uniting.

Cut the lower end of the scion into a long, slim wedge, from one side for a distance of about 2 inches and on the other for a distance of about $\frac{1}{2}$ inch (see drawing).

Bevel the top of the rootstock in the same manner as described above for a cleft graft. On the high side of the bevel, slit the bark down for a distance of about an inch. Insert the wedge of the scion in between the bark and the wood of the rootstock, just behind the slit, keeping the wood of the scion against the wood of the rootstock and with the bark of the scion against the bark of the rootstock. Force the scion down for a distance of about $1\frac{1}{2}$ inches. Tie the graft in place to make sure that the cambium layers fit together snugly.

Bark grafts should also be covered with a bell jar, or with a can, as described above for cleft grafts, but should be set under lath or in a cold frame for protection against the sun. The temperature in the place where the graft is placed should not be allowed to go above 75° F. A covering of cheesecloth should help give such protection in summer.

Considerable heat is needed to insure a good union of stock and scion, but the graft should be protected against drying or sunburn. It is therefore much easier to handle grafts made in pots or tubs which can be moved around, than grafts made onto rootstocks planted in the ground.

After the cut tissues of either type of graft have united, the cover can be removed gradually. This will be after 8 to 10 weeks in the winter, or 4 to 5 weeks in the summer. Lifting the jar, or tilting it on one side will admit more air to the graft and allow the plant to harden off.

If the top of the scion shows wilting, the glass should be replaced for a short period, and the hardening off process started over again.

Close observation of the cut surfaces will show that callous tissue has formed against the scion. When this is evident, that part of the stock and scion not yet healed should be covered with grafting wax when the jar is removed. The tie used to hold the scion in place should also be removed at this time.

A cleft graft will usually start growth shortly after the union is complete. Bark grafts made in summer may remain dormant for several months, or may not produce any growth until the following spring.

Occasionally a scion will fail to unite because the cambium has not been properly matched, or the tissues have become infected or allowed to dry out. In this case, the rootstock may send up sucker growth. Some of the sucker growth may in time be large enough to be grafted. Weak stocks are not worth grafting, however.

Planting Camellia Seed

Camellias grown from seed sometimes take from 5 to 7 years to bloom. Only persons willing to give proper attention to them, or those wanting rootstocks for grafting should attempt to raise camellias from seed. Only once in a great while do flowers from seedlings amount to anything, but occasionally new and beautiful varieties are discovered this way.

Since camellia seed is not available at seed stores, most growers save seed from single varieties to produce propagating stock. Seed produced by careful hybridizing should be used to plant where worthy new varieties are desired.

Camellia seeds are large, sometimes measuring $\frac{3}{4}$ inch in length and over $\frac{1}{2}$ inch in diameter. The fleshy seed is covered with a hard outer shell.

To hasten germination, the shell may be carefully cracked. Some growers bore holes in the shell so that water may be admitted easily. In any case, care should be used to avoid injuring the inner seed.

Plant seed about $\frac{1}{2}$ inch deep, in good,

rich, well-drained soil in a specially prepared seedbed, tub or pot. Seed should be planted at the beginning of good growing weather—about March or April. Keep the soil moist during germination, which should take place in from 10 to 12 weeks,

if weather conditions continue to be favorable.

When seedlings are about 6 inches in height, they should be transplanted to individual containers and handled in the same manner as rooted cuttings.

Diseases and pests **must be controlled**

General Pest Control Program

As a rule, camellias are not subject to damage from very many pests or diseases. A good all-around control program for pests consists of spraying during the first of April and again during the latter part of September with a summer oil spray. Use any of the safe, refined oil emulsions at a strength of about 2 per cent—2½ ounces (6 level tablespoons) to the gallon of water.

Spray when the new growth has matured somewhat, and on days that are not very hot. Thorough coverage is important in order to reach all of the pests. If a low pressure sprayer is used, a second application about 10 days after the first would insure more complete control.

The addition of a teaspoon of 40 per cent nicotine sulfate, such as Blackleaf 40, may increase the efficiency of the oil spray somewhat.

Never apply DDT to camellias!!

Special Control Measures

The summer oil spray described above should give adequate control of most of the scale insects, aphids and spider mites. Other pests which occasionally attack camellias, and their suggested control measures are as follows:

Fuller's rose weevil (*Pantomorus godmani*) may attack camellias if other plants on which they are normally found happen to be planted close by. These wingless weevils feed on the edges of the leaves.

Cotton barriers tied around the base of the trunk or branches may be enough to

keep the weevils from crawling up to the leaves.

The black vine weevil (*Brachyrhynchus sulcatus*) attacks a number of California plants, including camellias and rhododendrons. The adult beetles attack the edges of the leaves, while the grubs, which live in the ground under the plant, may attack the bark just below the surface of the ground and even girdle and kill the plant.

Benzene hexachloride (BHC) is proving to be an excellent material for controlling these insects. A single application of the dust to the soil under the plant may be enough to give protection for several weeks against emerging adults. It probably will not kill the grubs, however.

This material is now available in concentrated form under such trade names as Isotox, or in the normal 6 per cent product. Allow 2 pounds of the 6 per cent product to 100 gallons of water, or 1 pound of the 60 per cent gamma isomer in 100 gallons of water.

The omnivorous looper, or measuring worm (*Sabulodes caberata*) may occasionally eat the leaves and flower buds of camellias. The worms can be controlled by the use of any good stomach poison, such as lead arsenate, used at the rate of ½ ounce to the gallon of water. Hand picking may be sufficient if only a few worms are present.

Where rootknot nematodes—a microscopic wormlike pest—are prevalent on other plants (as in sandy soils where there is good moisture and adequate heat), they may sometimes attack the roots of ca-



Flower blight, shown here on the flower on the right, is difficult to control because the fungus causing it lives in the soil and resists chemical fumigants. A healthy specimen is shown for contrast.

mellias. Under these conditions, it is advisable to avoid plants that are susceptible to nematode attack in the area where camellias are planted.

Diseases

Flower blight is evidenced by a discoloration of the flowers (see photo, above) and is caused by the fungus *Sclerotinia camelliae* which lives in the soil where diseased flowers drop. It may remain alive for several years.

Where this fungus appears, all diseased flowers should be gathered and destroyed. Leaving just a few diseased flowers may be sufficient to continue the life of the fungus in the soil indefinitely.

In the case of potted plants, it may be possible to remove the top 3 inches of soil and replace it with new soil in the hope that the resting stage of the fungus will be removed. Chemical treatment of the topsoil has so far proved ineffective in eliminating the fungus.

Yellowing of leaves may or may not be a disease. Some cases of yellowing are

thought to be caused by a virus, in which case it would be transmitted into cuttings or grafts. There is no known cure for yellowing caused by virus. Avoid propagation from plants thus affected.

Yellow mottled foliage on healthy plants may be the result of a genetic, or inherent factor, in which case it is thought that the leaves are naturally variegated. The extent of variegation may differ greatly on the same plant, as on some of the mottled forms of Daikagura.

Yellowing may also be caused by deficiency of nutrition in the soil, or by sunburn. Sunburn can be prevented by adequate shade for the plant. Nutritional deficiencies in the soil may be remedied, as explained on page 8 *et seq.*

Sunburn can usually be distinguished from nutritional trouble by observing the leaves which are partly shaded by others. If yellowing occurs only on exposed parts of the leaves, sunburn is usually responsible. If the whole leaf turns yellow, regardless of exposure, some nutritional trouble is usually involved.

Scar tissue (scab), which appears as small rounded or oval raised areas, sometimes develops on the underside of leaves. At first glance these raised areas may be mistaken for scale insects; closer examination will reveal a corky layer of cells.

Since no organism of any kind has been found in these scabs, it is now thought that the damage is due to too much wind, the presence of injurious gases in the air, or to the use of injurious sprays. These troubles should be avoided by proper choice of location and use of approved sprays.

Harmful insects that attack the very young leaves will need better control where this condition is present.

Bud Drop

Bud drop is not a disease in any true sense, but it does cause much concern to growers.

There is no one cause for bud drop, and at present it is not possible to draw any hard and fast conclusions as to the nature of the ailment.

The following appear to be factors affecting bud drop:

Bud drop seems to be inherent in some faulty varieties, such as *Pink Perfection*.

Wet weather during the time buds start to open may cause a moist rot to set in with the result that buds will drop.

Some plants seem to shed buds as a sort of automatic disbudding program, when they have set more buds than will normally ripen.

Injury to roots or crown may cause bud drop, but in this case the plant will usually show other signs of weakness also. Thus bud drop may be a symptom of loss of bark (as caused by grub damage) which may weaken or even kill the plant. Examine the crown.

If plants do not get enough water for several weeks in late fall, before the rainy season starts, they may be so weakened that they will drop buds later on.

Other factors are thought to be insufficient plant food in the soil, or poor drainage around the roots of the plant.

Flower Decline

The too rapid decline of flowers after they are open is usually due to exposure to excessive moisture, sun, or frost. This can usually be avoided by choice of location, as explained on page 8, or by removal of potted plants to a more favorable situation during the blooming period.

Some Camellia Sasanqua Varieties

Variety	Form of flowers	Color of flowers
Apple Blossom	single	pink fused on white
Blanchette	single	white
Cleopatra	semidouble	rose
Dawn	semidouble	white shaded blush pink at edges
Fuji-no-mine (Snow)	double	pure white with yellow stamens
Hugh Evans	semidouble	deep carmine
Judith	single	phlox pink
Maidens Blush	single	blush white
Shishigishira (sport of Showa-no-saki)	semidouble	deep pink
Showa-no-saki	semidouble	medium pink
Tanya	single	deep rose
White Doves	semidouble	white

N.B. These are grown primarily because of their early blooming period—from early October to December. Dealers in this species are importing many other fine varieties.

Some Popular Varieties of Pink Camellias

Variety	Class*	Remarks
Ake-Bono (Dawn) M	2	fine deep rose pink; large, compact; vigorous
Chandleri Elegans (Francine) M	6	rose pink; dwarf; slow growing; spreading
Chiyo-no-Hanagata (Dorothea Blanche) M	5	rose shaded white; large flower; upright; vigorous
Daikagura Shell Pink (High Hat) E-M	6	slow compact growth
Debutante (Sara C. Hastie) E-M	6	popular pale pink; light green foliage; vigorous
Eleanor Hagood L	7, 8	better than Pink Perfection; upright; vigorous
Enrico Bettoni (Sarah Frost) M	2, 3, 7	clear pink; large; not precocious; upright; variable; vigorous
Eugene Lizze M-L	5	light rose splashed white; slow; compact
Gen. George Patton M-L	3, 7	large; bright pink; upright; vigorous
Gov. Earl Warren M	3	popular; good exhibition variety
Herme Pink M	3	tall, slender plant; vigorous
Hoshiguruma (Star Wheel) E	3	deep pink, shaped like star wheel; dwarf; slow
Kumasaka (Lady Marian) M-L	3, 5	many flowers, precocious; large; vigorous; compact, upright; very popular
Lady Clare (Grandiflora Rosea) M	2	deep pink, very large; bushy; vigorous; popular
Lady Humes Blush M	8	white blushed pink; loose, spreading; slow
Louise Maclay (Grandiflora Superba) M-L	2	deep pink veined deep rose, petals crinkled; spreading; slow
Magnoliaeflora Southern (Rose of Dawn) M	2	blush pink, good; compact, upright; slow; popular
Marchioness of Exeter E-M	6	light pink, large; spreading willowy branches; vigorous; very pleasing
Margaret Higdon M	3	deep rose, large, petals margined white; floriferous; upright; vigorous
Mary Charlotte M	6	pleasing light pink; compact, upright; vigorous
Mathotiana Rosea (Pink Beauty) L	3, 7	clear pink; best in coastal area
Mrs. Howard Asper M	2	good large light pink, cup shaped like Lotus
Mrs. John Laing M-L	8	floriferous but rather small flowers; bushy, compact; vigorous
Mrs. Josephine M. Hearn M	3	rose pink, large fluted petals with high center; compact; upright
Mrs. K. Sawada (John Marshall) M	8	fine pale pink; patented variety; vigorous; compact, upright
Otome Pink M-L	8	one rose pink, one light pink; good bloomer; spreading, compact; slow
Pink Ball M	6	pale pink, heavy flower; leaves light green; upright, compact; vigorous
Pinkie M	8	good shell pink
Pink Perfection E-M	8	precocious; drops buds badly, needs disbudding
Pink Star M-L	5	distinctive shape; petals shatter; dwarf, spreading; slow growing
Rosea Superba L	7, 8	deep rose pink, large; upright; vigorous; compact

E, early; M, midseason; L, late.

* See pages 6-7.

Some Popular Varieties of Pink Camellias—Continued

Variety	Class*	Remarks
Rose Dawn M-L	3, 7	shape like Alba Plena; upright; good grower
Shin Akebone E-M	2	flesh pink, good yellow stamens; vigorous
Silvery Pink M	8	good light rose, shaped like Pope Pius IX; compact, upright
Valtevedda L	8	pink shading deeper pink on outer petals, cup shaped; well branched, compact, upright

Some Popular Varieties of Red Camellias

Adolphe Audusson M	2, 3	large red bloom of heavy substance; plant very sturdy
Amabilis Red M	1	good single; drops petals early
Anne Lindbergh M-L	5	rose red with high center; upright; vigorous
Arajishi E	6	upright; vigorous; tolerates full sun
Benten M	1	better than Amabilis; cup shaped; good substance
Blood of China (Victor Emmanuel) L	3	deep salmon red; large; compact; vigorous
Brilliant M	7	floriferous; upright; strong grower
Capitol City M-L	1	rose red; remains to be proven
Chandleri Rubra E	6	loose grower, spreading; almost same as Vedrine
Cheerful (Lucida) M	7	upright, compact; vigorous
C. M. Hovey (Colonel Firey) L	8	large dark red; spreading; slow growing; flowers shatter in hot weather
Covina M	3	rose red; compact; floriferous; easy to grow
Daikagura Red E-M	6	bushy; dependable bloomer; very popular
Elena Nobile (Napa Red) L	3	flame red; bushy, upright; vigorous; long season
Ella Drayton M-L	8	dark red; upright; vigorous; popular cut flower
Emperor of Russia M	5	large scarlet; multicentered; upright; compact
Flame M	2	deep flame red; large; floriferous; vigorous; upright; compact
Fred Sander (Fimbriata Superba) M	2	like a ruffled petunia in red; fimbriated petals; upright, compact; vigorous
Glen 40 L	8	fine deep red; precocious; upright, compact; slow growing
Goshoguruma L	2	brilliant red with heavy stamens or petaloids; very compact
H. A. Downing (Helen of Troy) M	2	bell-shaped flower; rose red veined blood red; bushy; vigorous
Imperator M	6	light red of good form; bushy; vigorous
John Illges M	1	bright red, trumpet shaped, good form, very large; medium loose, upright
Lady Mary Cromartie M-L	3	large flower; upright; vigorous; slow
Lady Vansittart M	2	large flower; floriferous; good substance; very compact; holly-like foliage

Some Popular Varieties of Red Camellias—Continued

Variety	Class*	Remarks
Maraschino M	3, 7	edge of petals curves upward; blooms all at once
Mathotiana (Julia Drayton) M	3, 7	large scarlet; rose-bud center inland; upright, compact; vigorous; very popular
Monjisu Red L	3	cherry red, floriferous; bushy; slow grower
Mrs. Charles Cobb M	5	dark red; spreading; vigorous
Otome Red M-L	3, 7	strong bushy plant; not well known
Pope Pius IX M	8	large dark red that keeps well; makes long growth; upright compact
Pride of Greenville M	6	large flower; tall grower; vigorous
Professor Charles S. Sargent M	6	dark red with pompon center, not always good; floriferous; upright, compact; vigorous
Tinsie M	1	a novelty miniature
Uncle Sam M	3, 7	rose red; bushy; vigorous; needs further tests
Warratah (Anemonaeflora) M	6	not good near coast; Arajishi is better
William Downing M	2	purple red, floriferous; bushy; vigorous

Some Popular Varieties of White Camellias

Abundance M	7	large petals, flowers last well; floriferous; tall; vigorous
Alba Plena E-M	8	large flowers; bushy grower; slow; weak grower
Alba Superba E-M	3	large flowers, yellow stamens; glossy foliage
Amabilis M	1	good single, like miniature Matilija poppy; upright; vigorous
Candidissima L	8	resembles a star; shy bloomer at times but popular for more than 100 years
Caprice M	5	some yellow in the white; upright; vigorous
Daikagura White E-M	6	good variety but just becoming available
Fimbriata (Alba Fimbriata) E	8	large, fringed petals; slow, bushy, spreading; popular over 100 years
Finlandia E-M	2	large, fluted; compact, spreading; slow
Gigantea Alba M	1	very large flowers; upright; vigorous
K. Sawada M	7	large white; new and being tested
Lotus (Grandiflora Alba) M	2	very large flowers; upright; vigorous
Magnoliaeflora Alba M	2	white with cream center like water lily; large flowers; bushy
Mathotiana Alba M-L	3, 7	large flowers; petals roll back; upright; vigorous
Nobilissima E-M	5	white shading to yellow; upright; vigorous
Otome White (White Bleichroeder) M	3, 7	medium flower; slow; compact
Pax L	8	white laurel-leaf; good bud center
Pride of Descanso M	2, 5	new; large with regular petals; upright
Purity (Shiragiku) M-L	3, 7, 8	slight yellow shading at center; floriferous; good cut flower; upright; vigorous
Supresse Nobilissima M	6	large, good, irregular; upright; fast grower
White Empress E-M	2	very large; compact, upright; vigorous
White Herme M	3	upright; vigorous
White Perfection L	8	compact; vigorous

Some Popular Varieties of Variegated Camellias

Variety	Class*	Remarks
Adolphe Audusson Variegated M	2, 3	large bloom of heavy substance, dark red spotted white; compact, sturdy
Ake-Bono Variegated M	2	white lined rose pink; compact, strong grower
Amabilis Variegated M	1	pale pink striped deeper pink; upright
Anita M	2	light pink striped carmine; upright, vigorous; compact; a striking flower
Bella Romana E-M	6	light pink striped and splashed carmine; floriferous; very dense growth; shatters
Capt. John Sutter M-L	8	rose pink blotched white; upright; vigorous
Chandleri Elegans Variegated M	6	rose pink and white; one of the best; slow; spreading
Countess of Orkney M-L	7	white base peppered and striped red; a good flower, better than Peppermint; compact
Daikagura Variegated E-M	6	rose pink splotched white; flowers over a long season; slow; compact
Delectissima E-M	1	white with wide pink stripe; large; spreading
Donckelari E-M	2	red marbled white; large bloom; slow grower; an old favorite
Emperor of Russia Variegated M	5	variegated scarlet, large; slow; upright
Emperor Wilhelm E	6	angular growth, large leaves, large blooms; hard to propagate
Finlandia Variegated M	2	white streaked crimson; needs pruning
Flame Variegated M	2	deep flame red spotted white; upright, compact
H. A. Downing Variegated M	2	rose red marbled white; large; vigorous; bushy
Herme (Hikari Gengi) M	3	pink petals with white border and streaked deep pink; one of the best and dependable
Kasuga Shibori M	8	red blotched white; not common; spreading
Kumasaka Variegated L	3, 5	rose blotched white; vigorous; upright
Lady Clare Variegated (Oniji) M	2	deep pink marbled white; bushy; vigorous
Lallarook (Laurel Leaf) M-L	8	pink marbled white, large; compact, upright; slow
Mallot Variegated (Princess Nagaskie) M	2	soft pink marbled white and rose, large; low, spreading; vigorous
Matsukasa (Pine Cone) L	5	cone shaped; rose pink marbled white; free flowering; bushy; slow
Mikenjaku M	2, 4	red with white blotches; spreading
Monjisu Variegated M-L	3	red marbled white; floriferous, showy; low and bushy
Nagasaki M	2	rose pink marbled white, very large; spreading; interesting color and form; slow
Otome Variegated (Baronne de Bleichroeder) M	3, 7	soft pink streaked crimson; form similar to Pink Perfection; compact; slow
Paeoniaeflora M	6	white to cream with a few rose-red lines; large, shaggy; bushy; very old variety
Pierette M	8	flesh pink striped cherry red; large; not common; bushy; slow

Some Popular Varieties of Variegated Camellias—Continued

Variety	Class*	Remarks
Prof. Charles S. Sargent Variegated M	6	dark red mottled white; semidwarf; floriferous
Sensation M	2	new white to cream with rose stripes; large; compact, upright; vigorous
Sweeti Vera M	6	white and pale pink, large; open, upright; vigorous
Tricolor Sieboldi M	2	white streaked carmine; large, slightly cupped; upright; vigorous; old variety for mass effect
Wakanoura Variegated E-M	2	similar to above; long season; bright green leaves

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J. Earl Coke, Director, California Agricultural Extension Service.